

Ecosystem Management and Nonindustrial Private Forest Landowners in Washington State, USA

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Washington's non-industrial private forest (NIPF) landowners control 1.2 M ha, or nearly 20%, of the forestland in Washington State. Results of a mail survey suggest that educated and informed NIPF landowners are more likely to show interest in ecosystem-based management programs. NIPF respondents in Washington State indicated an appreciation for the temporal vision and landscape perspective crucial to understanding the foundation of ecosystem management. It is concluded that public agencies need to involve private landowners in ecosystem-based projects by using a more 'place' based cross-boundary management approach. NIPF landowners must be actively involved in the decision-making so that the process, for them, is one of self-governance. Providing landowners with opportunities for education and assistance may offer the best prospects for achieving ecosystem management objectives across diverse ownerships

INTRODUCTION

Washington State has over 8.5 M ha of forestland, 61% government owned and the balance privately (Table 1). Washington's non-industrial private forest (NIPF) landowners control 1.2 M ha, or nearly 20%, of the forestland not owned by the forest industry in Washington State (MacLean *et al.* 1992, McKay *et al.* 1995). Recent harvest restrictions on public forestlands intended to protect endangered species have resulted in lower wood harvests in the Pacific Northwest. Since 1987, timber harvests have declined 95% on federal lands and 57% on state lands in Washington State (WA-DNR 1999). While the harvests decline on public lands, NIPF landowners have continued to harvest timber, and are playing a greater role in supplying timber for commercial sale. NIPF landowners harvested nearly 1.2 billion board feet (Scribner scale) in 1998, accounting for 29.3% of the timber harvest in the state on a volume basis (Larson 2000).

Both private and public landowners are facing challenges regarding society's view of forests and traditional forest management practices (Brunson 1993). Opinions about the use of forests and forest resources range from utilitarian to deep ecology. Regardless of the philosophies of individuals, society as a whole is demanding a more holistic approach to natural resource management. Issues of water quality, forest fragmentation, endangered species and sustainable resource use

are at the forefront. Ecological considerations of preserving biological diversity and restoring ecosystem functioning, while providing a sustainable resource base, are challenges for both professional natural resource managers and NIPF landowners.

Ecosystem management is a concept born from the challenge to develop forestry practices that are ‘...scientifically sound and socially acceptable...’ (Salwasser 1990). Although the basic principles of ecosystem management have been a part of natural resource conservation since Aldo Leopold, the specifics were somewhat indefinable (Nelson, 1996). Government agencies have adopted many of the principles of ecosystem management in directing their land management activities, but there is still debate regarding the goals of ecosystem management and how they should be met (Yaffee 1996 b). A definition widely accepted by natural resource managers is ‘...knowledge and technology can be used in actions to encourage desired conditions of ecosystems for environmental, economic, and social benefits, both now and for future generations’ (Salwasser 1994). This definition has its limitations; the meaning of ‘desired condition’ differs between individuals and among society as a whole. Nonetheless, there are some major elements of ecosystem management that are important. The first is that the scale of ecosystem management takes place over the long term, with a greater geographical expanse than do traditional management activities (Yaffee 1996 a). Second, management is centered around the relationships between the biotic and abiotic factors of an ecosystem, rather than on managing specific populations of organisms (Irland 1994, Salwasser 1994, Barnes 2000). Third, ecosystem management transcends the boundaries of geography, administration and ownership (Grumbine 1994).

Table 1. Ownership of forestland and timber harvest for Washington State

Ownership type	Forest ownership (% of total)	Timber harvested in 1999	
		Quantity (1000 board feet)	Fraction of harvest (%)
Forest industry	20%	1,864,325	42.5%
Nonindustrial private	19%	1,381,491	31.5%
Native American	6%	333,904	7.6%
State	11%	677,570	15.4%
Federal	44%	125,489	3.0%
Total	100%	4,382,779	100%

Source: USDA (2000).

Ecosystem management has yet to be officially applied to non-industrial private forestlands (Rickenbach *et al.* 1998) for a number of reasons. Because of its ‘across boundaries’ approach and the implications of regulatory increases and loss of control, many NIPF landowners perceive ecosystem management as a means for the government to take away their private property rights (Brunson *et al.* 1996). Past studies indicate that many NIPF landowners in the US agree that, if necessary,

private property rights should be limited in order to protect the environment (Jones *et al.* 1995). Under an ecosystem-based management regime, however, property rights issues may become a more significant deterrent to participation by private landowners (Rickenbach *et al.* 1998). Private forestlands are home to more than half of the nation's threatened and endangered species (Irland 1994), which raises concerns for NIPF landowners about the impacts of increased regulations on private lands. Distrust of government by private landowners makes potential partnerships between private and public interests difficult. In order for ecosystem management to be successful both private and public forestlands must be involved.

In 1994, a study of NIPF landowners in the Midwest, Southeast, and Interior West regions of the United States attempted to determine landowner attitudes towards ecosystem management. Researchers found agreement across the regions regarding the basic tenets of ecosystem management, including the statements '...ecosystem management lets us protect endangered species while continuing to harvest goods' and '... ecosystem management is really what responsible forest owners and managers have been doing all along' (Brunson *et al.* 1996). A similar study in Massachusetts also found that landowners hold generally favorable attitudes towards ecosystem management approaches to forest management (Rickenbach *et al.* 1998). Yet, private landowners in the multi-regional survey were hesitant to apply the same level of ecosystem management principles to their own property as they would to public lands, and many believed there would be few benefits in applying ecosystem management principles to private lands (Brunson *et al.* 1996). Researchers in the Massachusetts study pointed out that attitudes are one thing; what is important is landowner behavior (Rickenbach *et al.* 1998).

The objectives for owning forestland help to shape landowner attitudes towards ecosystem-based management. Both of the previously mentioned studies indicate that, for a majority of respondents, privacy is an important reason for owning forestland. A 1988 survey of NIPF landowner use of assistance and education programs in Washington State yielded similar results (Blatner *et al.* 1991). This seemingly nation-wide commonality among NIPF landowners may prove a hindrance to ecosystem-based management, if the desire for privacy deters landowner willingness to cooperate across ownership boundaries (Rickenbach *et al.* 1998).

The protection of private property rights, landowner distrust of regulatory agencies, familial legacies, and equal access to market shares are at forefront of private forest management issues (Robinson 1996). Intermingled ownerships, varying land-use objectives, and the independent nature of many landowners make ecosystem management a challenging endeavor (Irland 1994).

This paper presents findings from a recently completed survey of NIPF landowners in Washington State. The survey was conducted in an effort to develop an updated profile of NIPF landowners in the state and their views on a wide range of environmental issues, including ecosystem management. This information will be useful for extension foresters assisting private landowners, and public agencies working with intermingled ownerships.

SURVEY METHODS

In 1998 and 1999 a random sample of NIPF forestland owners was drawn from all forested counties in Washington. Sample sizes for each individual county were based on the proportion of NIPF lands in that county. A total of 800 names from western and 800 names from eastern Washington were drawn. In addition, an over-sample of 400 Washington Farm Forestry Association (WFFA) member names was drawn for the entire state for use in subsequent reports, but will not be discussed here. The results presented here represent a weighted average of the responses for the state as a whole. This approach allows for the inclusion of the data from the WFFA over-sample by weighting it in proportion to the overall NIPF landowner population in Washington.

The instrument design followed an extensive review of previous surveys of similar focus, with new questions developed specific to Washington State. In particular, permission was obtained to use a series of questions from a recently published study of Massachusetts NIPF owner attitudes concerning ecosystem management (Rickenbach *et al.* 1998). Based on these questions, landowner attitudes concerning three dimensions of ecosystem management were measured. Questionnaires were mailed to landowners during early fall of 1999 by the Washington State University Social and Economic Sciences Research Center (SESRC). The overall completion rate was 49%. SESRC compiled and verified the data and the authors completed all subsequent data analysis.

SURVEY FINDINGS

Survey respondents averaged 57 years of age, with 42% between the ages of 40-55 and 31.8% between 56-70 years of age (Table 2). Fifty-eight percent indicated they had attended college, with 17% of those having gone to graduate school. Eighty-five percent of the principal decision-makers were males, and over 93% characterized themselves as Caucasian. Annual household income ranged from below \$10,000 (4%) to over \$70,000 (30%), slightly more than half having an annual household income in excess of \$50,000 per year.

The range of parcel size was 0.5 to 4,050 ha, with 45% of respondent ownership size in the 4 to 19 hectare category (Table 2). Twenty-eight percent indicated they had a written forest management plan in place. Fifty percent of the respondents had their permanent residence on the property. Fifty percent of the remaining respondents are absentee landowners, 48% of whom live more than 30 kilometers from their forest properties.

Reasons for Ownership

Respondents were asked to rate a wide variety of land ownership objectives using a four-point Likert scale with categories ranging from very important to very unimportant without the option of a 'no opinion' midpoint (Table 3). At least 80% of the respondents rated each of the following reasons for land ownership as somewhat to very important: 'privacy' (88%), 'satisfaction from owning land' (87.5%), 'attachment to land' (86.9%), 'scenic beauty' (84.9%) and 'provide wildlife habitat' (80.6%). Seventy-seven percent of respondents ranked 'a legacy for my children' as

Table 2. Characteristics of Washington nonindustrial private forest (NIPF) landowner survey respondents, 1999

Characteristic	Range	Percentage
Age (n = 803)	< 40 years	7
	40 – 55	42
	56 – 70	32
	+70	19
Education (n = 570)	Never attended school	0.5
	Elementary school	2.5
	High school	29
	Trade school	10
	Some College	58
	Graduate school	(17)
Income (n = 495)	Under \$10,000	4
	\$10,000 - \$49,999	45
	\$50,000 - \$69,999	21
	\$70,000 or more	30
Hectares owned (n = 827)	<4 hectare	14
	4 – 19	45
	20 – 40	18
	41 – 161	17
	+161	6
	(Median)	(16)
Management plan (n = 820)	Yes	28
	No	72
Years owned (n = 832)	< 5 years	10
	5 – 14	28
	15 – 29	33
	30 – 79	27
	80+	2
Residence on property (n = 592)	Yes	50
	No	50
Proximity to residence (n = 412)	1.6 – 8 km	17
	9 – 24	14
	25 – 40	7
	41 – 80	14
	+80	48

somewhat to very important reason for owning forestland. 'Protection of fisheries and wildlife', 'letting nature take it's course', and 'a place to hike and camp' were ranked in relative importance at 73.1%, 66.7% and 58.8%, respectively. Nearly half (48.5%) of respondents also indicated that income from the sale of timber was a somewhat to very important ownership objective. One third of the respondents indicated 'a place to hunt and fish' (34.3%) and 'access to nearby recreation' (33.6%) were somewhat to very important.

Table 3. Reasons for forestland ownership, ranked very important to somewhat important, given by NIPF landowners respondents, 1999 (n = 570)

Reason for ownership	Very to somewhat important (%)
Privacy	88.0
Satisfaction from owning land	87.5
Personal/sentimental attachment to land	86.9
Scenic beauty and aesthetics	84.9
Provide wildlife habitat	80.6
A legacy for my children	77.4
Protect fisheries and wildlife	73.1
Let nature take its course	66.7
A place to hike or camp	58.8
Income from timber	48.5
Investment for future resale of land	44.7
A place to hunt and fish	34.3
Access to nearby recreation	33.6
A place to ride motorbikes, snowmobiles, etc.	16.4
Eventual commercial development/ subdivision	14.4
Income from hunting leases	1.23

These results indicate that Washington's NIPF landowners have a strong sense of stewardship towards their forestlands. A large proportion of landowners identified several non-monetary values of land ownership, including privacy of a rural setting, the satisfaction of owning land, the opportunity to contribute to fish and wildlife conservation, as well as income opportunities from commercial timber sales. These results are consistent with similar studies completed for other regions in the United States (Blatner *et al.* 1991, Brunson *et al.* 1996, Rickenbach *et al.* 1998). This suggests that NIPF landowners view their forests as a multi-use resource, such that they can achieve environmental, economic, and social benefits from their lands. This coincides with the definition of ecosystem management stated earlier (Salwasser 1994). However, recent studies suggest that voluntary participation by landowners in

ecosystem management programs is often stalled by a fear of increased regulations (Raedeke *et al.* 2001).

Ecosystem Management

Respondents were asked a series of questions to determine their attitudes regarding three dimensions of ecosystem management based on Rickenbach *et al.* (1998). These categories include (1) small-scale sensitivity: identification of unique habitat features that sustain their property but may not occur in the surrounding lands, (2) temporal vision: addressing the use of their land in the future, and (3) landscape perspective: an awareness that their property fits into a larger system.

Small-scale sensitivity

The majority of respondents indicated agreement with many of the small-scale sensitivity issues, indicating a strong sense of stewardship (Table 4). Such issues include the importance of individual plant and animal species (77% positive responses), protection of rare and threatened species (68% positive responses), and protection of sensitive areas (68% positive responses). The personal benefits of wetlands and the importance of protecting seeps and bogs received favorable responses as well (67% and 64%, respectively). Thirty-six percent of respondents indicated that they would be pleased if a rare or threatened species was found on their land. This is somewhat surprising, given that the presence of a rare or threatened species on one's property means severe land-use restrictions. Within this same subset of respondents, 43% had harvested timber for commercial sale, with 60% of these harvests having occurred since 1995.

There were no statistical differences for the desire of the presence of rare species with respect to property size or years of ownership; but there was a significant difference with respect to level of respondent education (Pearson $\chi^2 = 57$; $p = 0.0098$). Of the 257 respondents who said they would be pleased if a rare or threatened species was found on their land, 23% (59) had a high school education, 38% (97) had attended college, and 21% (54) had attended graduate school. Of the 401 respondents who indicated they would not be pleased, 25% (100) had a high school education, 41% (164) had attended college, and 18% (72) had gone to graduate school. This suggests, that the higher the education level the less likely the respondents are to want a rare species on their properties. This does not suggest that respondents feel rare and endangered species should not be protected. It does indicate, however, that the majority of respondents are unwilling to deal with the regulatory issues surrounding endangered and threatened species protection in the U.S. The fact that the majority of these respondents are well educated may reflect a greater knowledge of the laws regarding government control, regulatory compliance, and personal property rights. It may also reflect private landowner concerns surrounding potential economic impacts of the Endangered Species Act on their financial well-being (McGlinchey *et al.* 1994) or privacy.

Over half of the respondents (56%) agreed that too much emphasis is placed on economics in land-use decision-making, and 59% placed ecology above their own economic needs. There was a significant difference with ecological health versus economic needs with regards to place of residence (Pearson $\chi^2 = 51$; $p = 0.0012$). Economic needs were identified as being more important than the ecological health of the forest for only a small proportion of the respondents.

Table 4. Small-scale sensitivities of survey respondents: regarding forests and woodlands, in general

Statement	Agree to somewhat agree (%)	Frequency	n
The ecological health of the land is not as important as my economic needs	18 (59) ¹	109 (345)	591
Land must provide a return to cover the expenses associated with ownership	39	230	592
I would be pleased if a rare or threatened species was found on my land	36	210	589
Individual plant and animal species are not important to me	10 (77) ¹	61 (458)	590
Wetlands are beneficial to me	67	396	588
Too much emphasis is placed on economics when decisions are on how to use land	56	331	589
Human use should be minimized in seeps, bogs, and other sensitive areas	64	378	586
Sensitive areas should not be protected from activities that could alter them	16 (68) ¹	93 (394)	578
Rare and threatened species should be protected	68	404	590

¹ Figures in parentheses are numbers of respondents who disagree to strongly disagree with the statement.

Income from timber was significant with regards to place of residence for absentee landowners (Pearson $\chi^2 = 34$; $p < 0.0006$). Of respondents not living on their forestland but in the same county, 45% indicated that income from timber was important, and 27% of those living elsewhere in the same state also indicated that income from timber was important. However, there were some differences among absentee landowners. Of the 45% of absentee respondents who indicated that income from timber was important, 76% reside elsewhere in the same county and 56% in the same state. The discrepancies between resident and absentee landowners may reflect more of a 'sense of place' attitude towards forestland ownership by those who reside on their properties. In other words, landowners with a strong 'sense of place' may be more likely to consider how their forest practices impact upon their community, as reported by other studies (Weber 2000, Cantrill 1998). Although income from timber was cited as an important reason for forest ownership for both

resident and absentee landowners, those respondents who live on their forest may be more sensitive to ecological processes occurring around them, and thus are less inclined to place economic needs above ecological health.

Significant differences were also detected with regard to the question of personal economics versus ecological health with regards to past timber harvest activities (Pearson $\chi^2 = 42$; $p < 0.0001$), and with future plans for forest parcel (Pearson $\chi^2 = 41$; $p = 0.0219$; Table 5). Of those respondents who indicated that personal economics are more important than forest ecological health, 50% had harvested in the past, for a total of 902 ha, with 457 ha harvested through clearcutting, and 444 harvested by partial-cut methods, such as thinning and selection harvest. Twenty-seven percent indicated plans to harvest within the next five years, 20% plan on harvesting sometime in the future, and 23% said they have no plans to harvest at all. Of those respondents who stated that personal economic needs are not as important as ecological health, 63% had harvested a total of 1,801 ha, with 304 ha harvested by clearcutting methods and 1,497 ha by partial cut techniques. Twenty percent of this group plan to harvest within the next 5 years, 27% plan on harvesting sometime in the future, and 30% have no plans for any future harvest.

Table 5. Timber harvesting behaviors of respondents regarding the importance of economic needs versus ecological health

Activity or intention	Ecological health more important	Economic needs more important
Respondents who harvested in past	63%	50%
Clear-cut area	304 ha	457 ha
Partial-cut area	1497 ha	444 ha
Total area harvested	1,801 ha	902 ha
Plan to harvest in next 5 years	20%	27%
Plan to harvest sometime in future	27%	20%
No plans to harvest	30%	23%

Past studies suggest that landowners with a basic working knowledge of forestry are more likely to make sustainable harvest decisions, regardless of what their professed land ethic might be (Jones *et al.* 1995). Respondents who placed ecological health above economic needs harvested more timber overall, with a greater proportion of area harvested using partial cutting methods, as opposed to clearcutting. Respondents who favor economic needs over ecological needs harvested less overall, but a proportionally larger area was harvested using clearcutting method. This may indicate a higher degree of active sustainable forest management by more 'ecologically-minded' individuals.

Temporal vision

Respondents agreed strongly with the managing of resources for future generations (Table 6). Eighty-seven percent agreed that society has a responsibility to provide for the future, and many respondents agreed that their land should provide for future generations (72%), as well as future plant and animal communities (75%). There are

indications of a strong land ethic and willingness to manage for resource sustainability.

Table 6. Temporal vision of respondents: regarding the management of their forestland for future generations.

Statement	Agree to somewhat agree (%)	Frequency	n
What I do on my land will not matter in the long-term	15 (77) ¹	85 (445)	580
My land need not provide for the future	13 (72) ¹	76 (412)	578
My land should provide for the needs of future plant and animal populations	75	440	587
I have a responsibility to leave my land in at least as good as shape as I found it	86	507	586
Society has no responsibility to provide for future generations	5 (87) ¹	32 (516)	590
Land is a testament to the previous owner	66	383	578

¹ Figures in parentheses are numbers of respondents who disagree to strongly disagree with the statement.

Landscape perspective

Responses to landscape-level questions indicated an understanding of the importance of their forests in the community and the region (Table 7). Ninety percent of respondents agree that forests and woodlands benefit the local community, as do wetlands (78%). Interestingly, although 74% indicated that their neighbours' land-use actions affect them personally, only 69% agreed that what they do on their own land impacts their neighbours. Whether this opinion is the result of self-stereotyping among forest owners or of observed land-use behaviors, it illustrates another hurdle to implementing an ecosystem management program: the issue of cross-boundary cooperation. In terms of landowner willingness to cooperate across boundaries, 73% of respondents recognize their land as part of a larger system, and 67% revealed that they would be willing to work with others if the forest benefited. Although there is a large percentage indicating a willingness to manage their forests across ownership boundaries, it is difficult to determine who would actually participate in such a program (Rickenbach *et al.* 1998). Many respondents expressed a concern regarding the potential impacts on themselves by the land-use actions of their neighbours, but fewer were willing to admit to impacts that they themselves might have on their neighbours. Cynicism towards public agencies, potential economic risks, and a distrust of neighbouring landowners may affect participation. This suggests the necessity of recognizing they way an individual landowner, or an entire rural community, defines an ecosystem involves

political and economic criteria, rather than ecological ones (Yaffee 1996 a, Weber 2000).

Table 7. Landscape perspective of respondents: regarding their land and their communities.

Statement	Agree to somewhat agree (%)	Frequency	n
My land is part of a much larger system	73	410	560
My land is not important to others	20 (58) ¹	117 (330)	567
What I do on my land affects others	69	388	563
My land provides important habitat for wildlife	88	519	587
My property is insignificant in the big picture of all land in the county	32 (49) ¹	189 (284)	583
I would consider working with others if it meant the forest would be better off	67	393	589
Wetlands are of no benefit to others	6 (78) ¹	34 (458)	588
Forests and woodlands do not benefit the local community	4 (90) ¹	22 (529)	584
What my neighbours do on their land does not affect me or my land	15 (74) ¹	91 (436)	588

¹ Figures in parentheses are numbers of respondents who disagree to strongly disagree with the statement.

Landowner Interests in Additional Information

Survey participants were asked to identify topics of interest for which they would like more information. Of the 872 respondents, 48% (424) indicated they were very to somewhat interested in receiving more information on ecosystem management, 38% (331) said they were somewhat to very uninterested, and 13% (117) did not answer the question.

There were significant differences regarding interest in ecosystem management with respects to six categorical factors: respondent education level, income level, employment status, having a written forest management plan, completion of a forest management planning course, and past attendance at an extension forestry educational workshop or tour (Table 8).

Table 8. Factors where significant differences were detected (α level at 0.05) for the response variable ‘*an interest in ecosystem management*’

Categorical factor (872 respondents)	Pearson χ^2	p value
Education level	62	0.0002
Income level	75	0.0005
Employment status	67	< 0.0001
Having a written forest management plan	111	< 0.0001
Completion of a forest management planning course	147	< 0.0001
Past attendance at an extension forestry educational workshop or tour	39	< 0.0001

Educational background

Regarding educational background, of the 424 respondents who indicated an interest in ecosystem management, 21% (89) had completed high school, 42% (178) had attended college, and 23% (97) attended graduate school. For the 331 respondents who indicated little or no interest in ecosystem management, 32% (106) had completed high school, 35% (115) had attended college, and 14% (46) had attended graduate school. Other education categories included, no formal education, an elementary school education and a trade school education. These factors had frequencies of less than 10% for both respondent groups and are not reported here. These results indicate that respondents interested in ecosystem management have a higher level of background education, with more having attended college and graduate school than their uninterested counterparts, and fewer with only a high school education.

Income level

Differences in ecosystem management interest and income level were detected only with those respondents earning annual incomes of \$80,000 or more, with 25% of those in this income level indicating interest in ecosystem management and 19% indicating no interest. The degree of economic dependence on their forestlands by the respondents in this survey is unknown. However, 48.5% did indicate that income from timber was an important issue and 44.7% do have plans for future resale of their property (Table 3). The affects of income and employment status on a landowner's willingness to participate in an ecosystem-based or a cross boundary management program are unclear. Responses to questions regarding income levels ranged from 42% of respondents with annual incomes of \geq \$60,000, and 25% with annual incomes from \$40,000-\$50,000 to 32% with incomes < \$40,000, the latter being less than the average annual income in Washington state (WSDS 2000). It is only possible to speculate as to income sources. Those landowners with below average incomes may rely more heavily on commercial timber sales to meet their economic needs, or conversely respondents with average earnings in excess of \$60,000 might depend on timber harvesting to maintain this level of income. A strong dependence on commercial harvesting may influence landowner interest in participation in a cross-boundary management program.

Employment status

In terms of interest in ecosystem management with regards to employment status, a significant difference was detected with respondents employed full-time, other than self-employment. Thirty four percent of respondents (146) with an interest in ecosystem management indicated they were employed full-time, 2% (12) specified part-time employment, and 31% (133) were retired. For respondents uninterested in ecosystem management, 25% (63) were employed full-time, 2% (6) specified part-time employment, and 36% (120) said they were retired. Other categories, all with low frequencies, included self-employed farmer/rancher, other self-employed, homemaker and student. The majority of respondents identified themselves as employed full-time, i.e. not in a self-employed business or as a rancher or farmer. Whether this indicates these landowners do not depend financially on their forestland cannot be determined from these data. It does suggest that the level of employment has some bearing on a landowner's interest in ecosystem management, but whether this is tied to financial status or educational background is unclear. Landowners with the greatest financial reliance on their land have the most to risk from ecosystem management programs, and if the neighbouring forest owner has no such concern, this brings up a potential economic inequity among participants.

Written forest management plan

Thirty three percent (142) of the respondents with an interest in ecosystem management had a written forest management plan and 64% (273) did not. For respondents not interested in ecosystem management, only 21% (70) said they had forest management plans and 77% (255) did not.

Educational programs

Concerning the use of educational programs, attendance at a forest management planning course was found to be significant in terms of ecosystem management interest as well, with 15% (63) interested respondents having attended such a course compared to 8% (27) respondents who had also attended a planning course, but indicated no interest in ecosystem management. Significance was detected for attendance at extension forestry educational classes and tours, with 27% (113) of respondents who attended a class or tour expressing interest and 18% (60) who also attended a class or tour expressing no interest. Respondents who indicated an interest in gaining more information about ecosystem management were more likely to have attended forestry education and management courses, and had a higher number of forest management plans overall than those respondents indicating no interest. This suggests a more active level of forest management and a willingness to expand their knowledge base regarding forests and forestry.

CONCLUDING COMMENTS

Intermingled ownerships make ecosystem management difficult and if the loss of decision-making power by an individual is potentially a result, this may dissuade even the most willing NIPF landowner from participating. Public agencies need to involve private landowners in ecosystem-based projects by using a more 'place' based cross-boundary management approach (Cantrill 1998). NIPF landowners must

be actively involved in the decision-making so that the process, for them, is one of self-governance (Weber 2000), and trust is created between both private and public stakeholders (Raedeke *et al.* 2001).

There are thousands of NIPF landowners in Washington State with a potential for many different forest management objectives. However, most respondents indicated an appreciation for the temporal vision and landscape perspective crucial to understanding the foundation of ecosystem management. Many of these landowners are working professionals with above average incomes, are well educated, and although they may have small individual holdings, collectively they control a substantial amount of natural resources. Education can provide tools to help NIPF landowners meet management objectives while at the same time providing them with information necessary to make land-use decisions that are ecologically sound, economically sustainable and socially acceptable.

This study, and similar ones carried out across the USA, suggests that better educated and informed NIPF landowners are more likely to show interest in ecosystem-based management programs. Providing landowners opportunities for education and assistance may offer the best prospects for achieving ecosystem management objectives across diverse ownerships (Irland 1994, Sample 1994, Campbell *et al.* 1996, Raedeke *et al.* 2001).

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